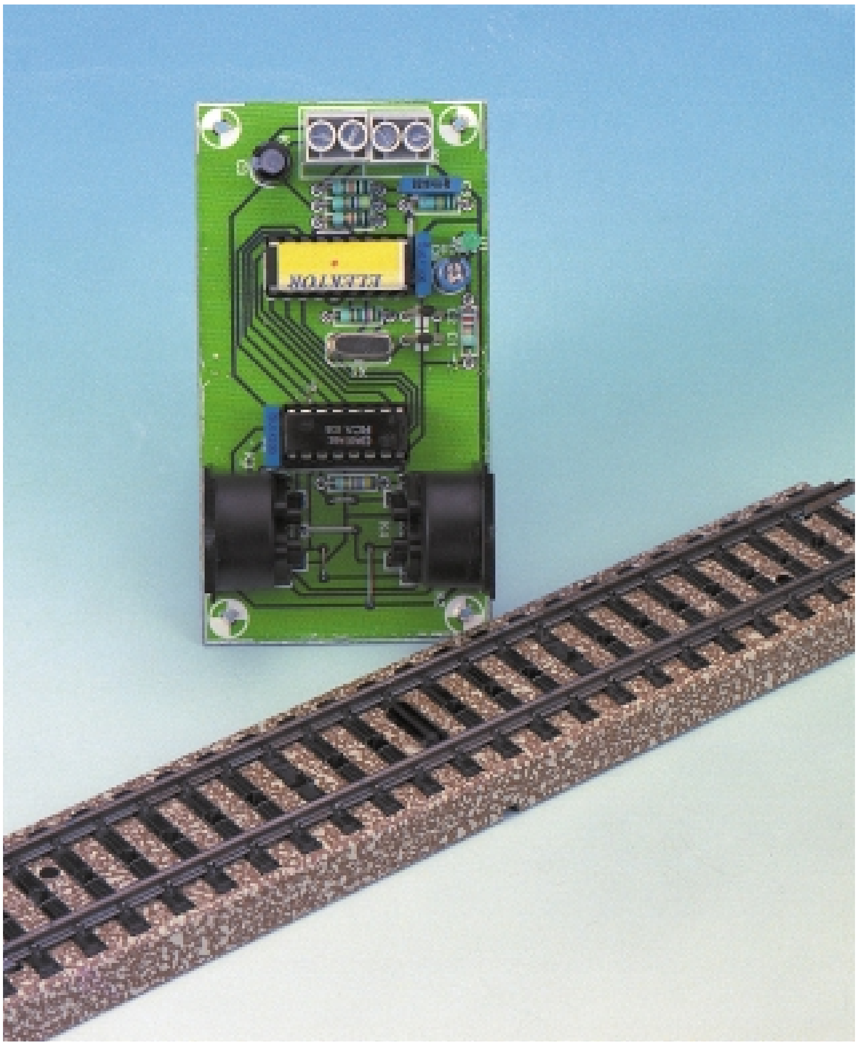
PC-controlled model railway

EEDTS-Pro loco address return signaller

With the circuit described in this article, locos that pass the return signaller can be identified. Depending on the loco number, the software can then choose a predefined track or an alternative track, or wait until the selected track is free. Just as with the full-sized version, we can now (for example) have a local train enter the station and wait at a platform for a given time to allow passengers to board, while a freight train rumbles along the freight track and a TGV speeds along a passing track.



Specifications of the EEDTS Pro return signaller

- *IR reception range up to several metres*
- *can be used together with Märklin S88 and 'old' EEDTS return signallers*
- *occupies one half of an S88 address space*
- *includes one contact rail*

Design by H. J. Prince

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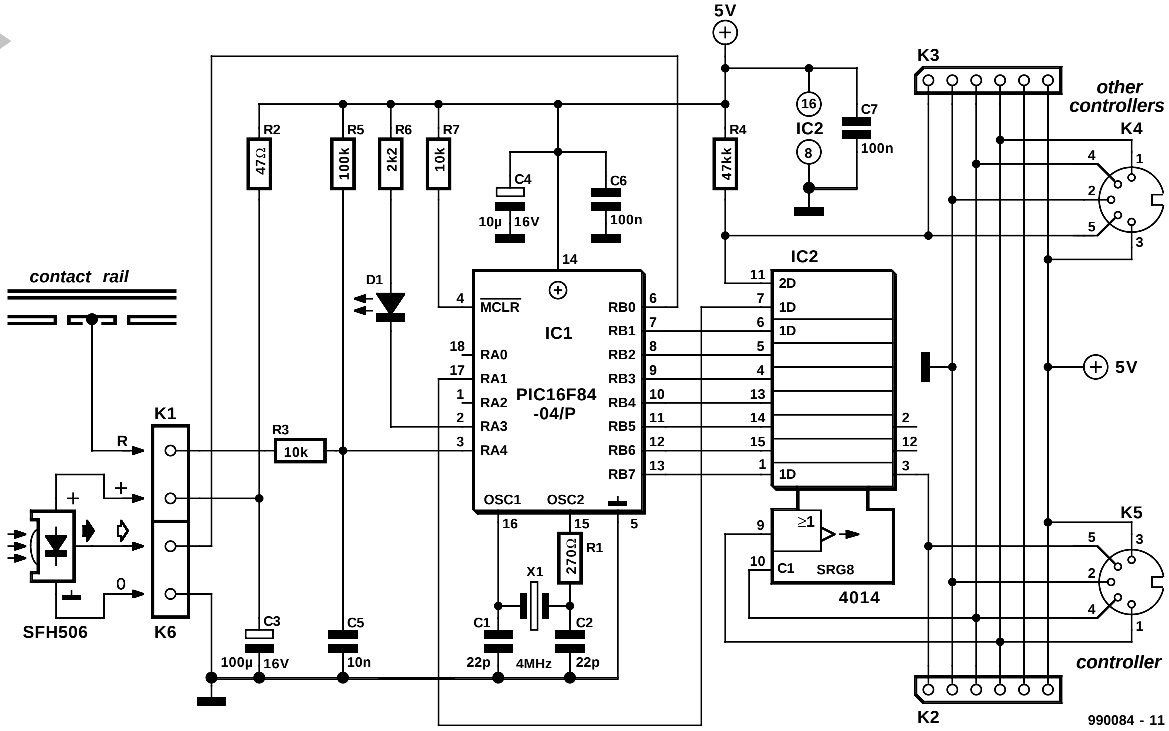

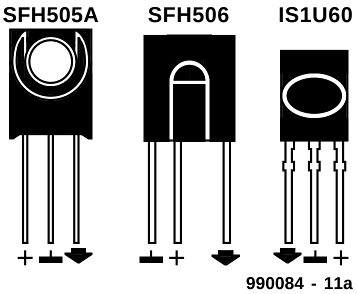

Figure 1. Schematic diagram of the loco address return signaller.

If you’re operating a good-sized model train system, it’s essential to know where every train is at any given time. Only then is it possible to properly carry out various activities, such as letting a train run along a specific track or stop at a platform. The new return signaller has been developed for this purpose. It utilizes an IR receiver that can be built into the railbed so that it is nearly invisible. Each loco transmits a unique number from its loco decoder, and this can be detected by the return signaller.

THE CIRCUIT

Just as with the loco decoder described last month, this circuit is built around a PIC 16F84 IC. At the left side of the schematic in **Figure 1**, we see the IR receiver (type SFH506). This module contains an IR receptor diode, an amplifier, a dynamic compressor and an HF demodulator. As soon as an IR signal is received from a loco that passes by the IR receiver, the signal is demodulated and appears in inverted form at the receiver output as an 8-bit pulse-code modulated signal containing the loco address. **Figure 2** shows a representation of this sig-

Figure 2. The signal at the output of the IR receptor.

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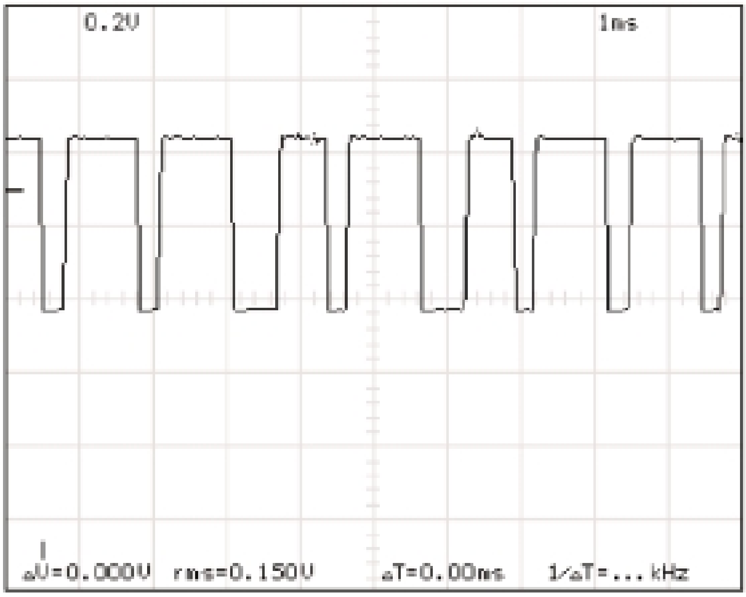

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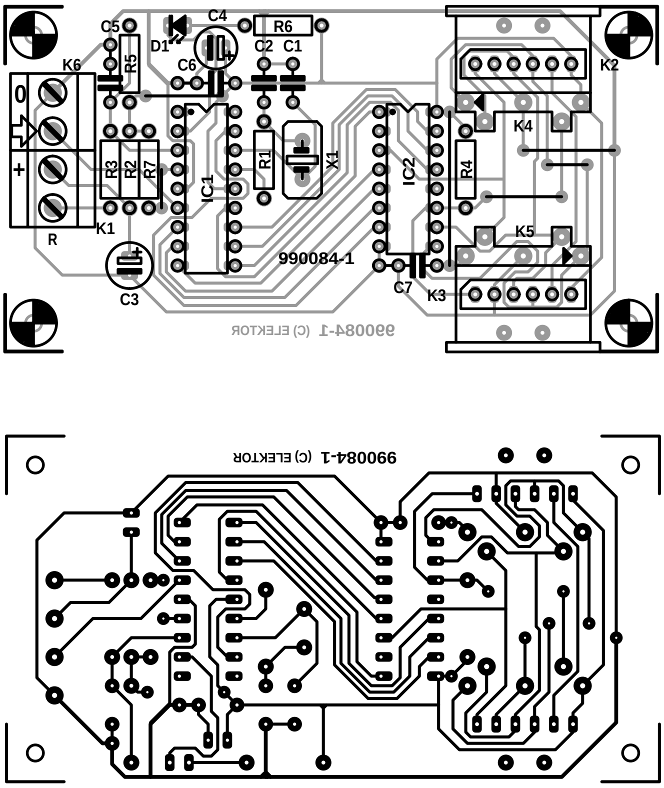

Figure 3. The printed circuit board and component layouts for the return signaller (board available ready-made).

COMPONENTS LIST

Resistors:
R1 = 270Ω
R2 = 47Ω
R3,R7 = 10kΩ
R4 = 47kΩ
R5 = 100kΩ
R6 = 2kΩ2

Capacitors:
C1,C2 = 22pF
C3 = 100µF 16V radial
C4 = 10µF 16V radial
C5 = 10nF
C6,C7 = 100nF

Semiconductors:
D1 = low-current-LED, red, 3 mm
IC1 = PIC16F84-04/P (programmed, order code **996523-1**)
IC2 = 4014
SFH 506

Miscellaneous:
K1,K6 = 2-way PCB terminal block, raster 5mm
K2,K3 = 6-way Märklin header
K4,K5 = DIN socket (female), 180 degrees, PCB mount
PCB, order code **990084-1**

nal, in this case the binary form of the address ‘24’.

This signal goes to the interrupt input of the PIC, where it is temporarily stored and compared with the next 8-bit data word that is received. If the two words match, a valid reception is signalled by switching on LED D1. The moment the contact rail is closed (pin 3 of the PIC is pulled low), the decoded address appears at the PIC output. The 4014 IC converts the address back into a serial data stream that can be recognized by the EEDTS Pro controller. The loco address return signaller can be connected in series with standard signalling units.

CONSTRUCTION

Putting together the circuit board, as shown in Figure 3, should not present any problems. With so few components involved, this task is quickly completed. Two circuit board terminals are provided for connecting the sensor to the contact rail. For connecting the return signaller to other signalling units and the controller, two DIN connectors (for EEDTS Pro) or two headers (for Märklin) are provided, allowing you to install only the connectors that you need for your own system.

A FEW PRACTICAL POINTS

The receiver must be placed in the vicinity of the passing loco. The handiest solution is to place it between the rails in the bed, as shown in the photo. This minimizes possible interference from other trains running along neighbouring tracks. In this case, the IR LED that is connected to the loco decoder to transmit the loco code number must naturally be located on the underside of the loco.

If the train passes quickly over the return signaller, there is not much time for the reception of two successive data words. It is thus important that the beam of light emitted by the IR diode is adequately broad, and that it is not blocked by the adjacent undercarriage of the loco.

After a valid address has been received, the loco must close the contact rail. The PIC then passes the address through to its output, so that it can be registered by the EEDTS Pro controller.

Of course, it is possible to use a reed switch in place of the contact rail, or to employ a circuit that works via the power-takeoff slider. A correct address has to be accepted before the switching input of the PIC goes low. As soon as the loco leaves the block and the input goes high again, the output will be reset after a certain amount of time, whereupon the return signaller output is reset and the address ‘0’ appears at its output. This means that if a loco with a conventional decoder passes the return signaller, the address ‘0’ will be transmitted when the contact rail is closed. The programming rules of the EEDTS program can be used to deal with this.

During the start-up phase, the EEDTS Pro software determines the addresses that are in use for the return buttons, which include the loco address return signaller. As soon as an address is missing, the system assumes that the last recognized address is the last one of which data may be requested. Consequently, the stream of addresses may not contain gaps. In case return signaller units are used that occupy two addresses, they always have to be assigned to at least one button. If this is not done, the next return signaller will not be recognized.

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